



US009423725B2

(12) **United States Patent**
Yamauchi

(10) **Patent No.:** **US 9,423,725 B2**
(45) **Date of Patent:** **Aug. 23, 2016**

(54) **IMAGE FORMING APPARATUS**

(56) **References Cited**

(71) Applicant: **KYOCERA Document Solutions Inc.,**
Osaka (JP)

(72) Inventor: **Hironori Yamauchi,** Osaka (JP)

(73) Assignee: **KYOCERA Document Solutions Inc.,**
Osaka (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/839,965**

(22) Filed: **Aug. 29, 2015**

(65) **Prior Publication Data**

US 2016/0062277 A1 Mar. 3, 2016

(30) **Foreign Application Priority Data**

Aug. 29, 2014 (JP) 2014-175551
Aug. 29, 2014 (JP) 2014-175552

(51) **Int. Cl.**
G03G 21/08 (2006.01)
G03G 15/16 (2006.01)

(52) **U.S. Cl.**
CPC **G03G 15/1605** (2013.01); **G03G 21/08**
(2013.01); **G03G 2215/0132** (2013.01); **G03G**
2215/0193 (2013.01)

(58) **Field of Classification Search**
CPC G03G 21/06; G03G 21/08
See application file for complete search history.

U.S. PATENT DOCUMENTS

2013/0156451 A1* 6/2013 Hano G03G 15/1695
399/49
2014/0139607 A1* 5/2014 Hayashi G03G 15/04054
347/224
2015/0309450 A1* 10/2015 Saito G03G 15/0136
399/128

FOREIGN PATENT DOCUMENTS

JP 2007-271873 A 10/2007

* cited by examiner

Primary Examiner — Gregory H Curran

(74) *Attorney, Agent, or Firm* — Hawaii Patent Services;
Nathaniel K. Fedde; Kenton N. Fedde

(57) **ABSTRACT**

An image forming apparatus being capable of commonalizing a control signal for lighting of static eliminators, and controlling the static eliminators with a single port of CPU. The image forming apparatus includes a main body control part controlling image formation; a nip separation mechanism separating an intermediate transfer belt from color photosensitive drums; a separation control part driving nip separation mechanism on a separation control signal inputted from main body control part; a monochrome static eliminator comprised of a monochrome light guide body and a monochrome light source irradiating light on its end face; color static eliminators comprised of color light guide bodies and color light sources irradiating light on their end faces; and an irradiation location shifting mechanism shifting irradiation location of light emitted from color light source from end face of color light guide body when intermediate transfer belt is separated from color photosensitive drums.

6 Claims, 9 Drawing Sheets

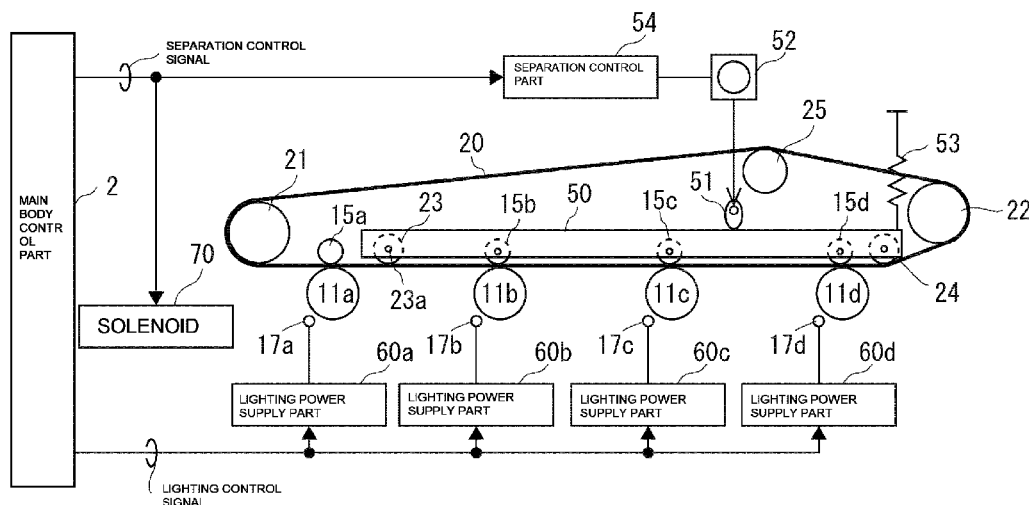
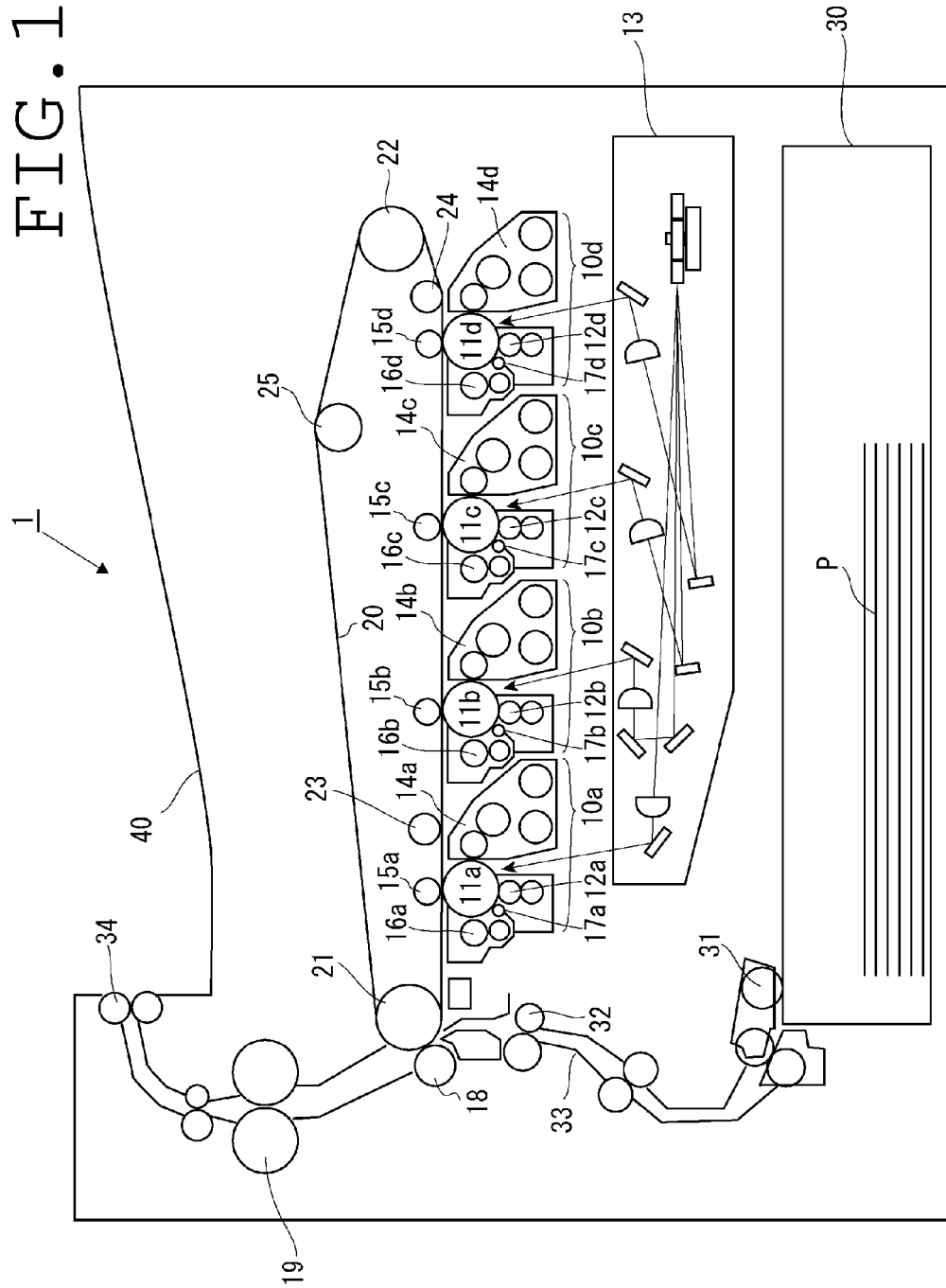


FIG. 1



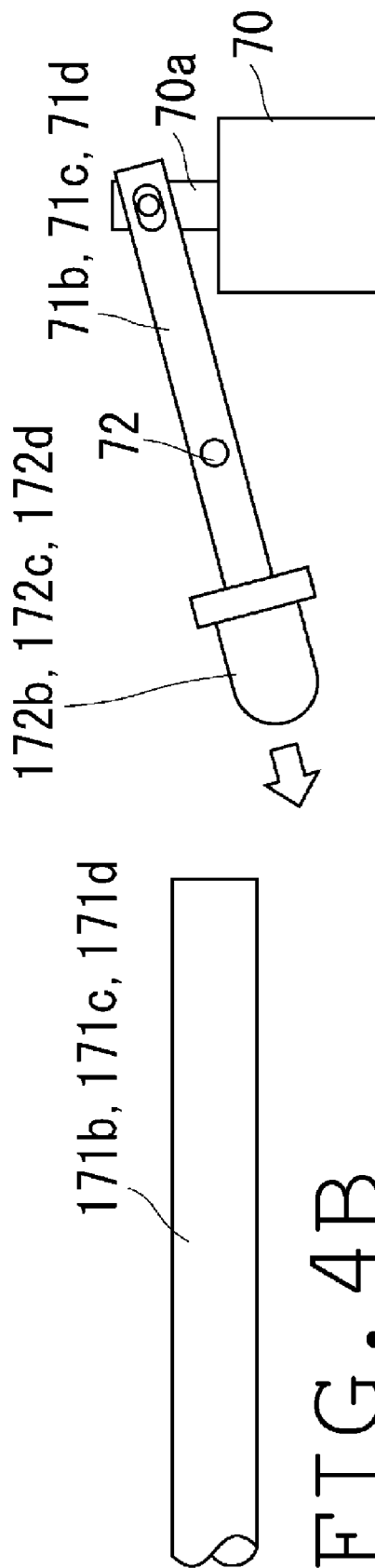
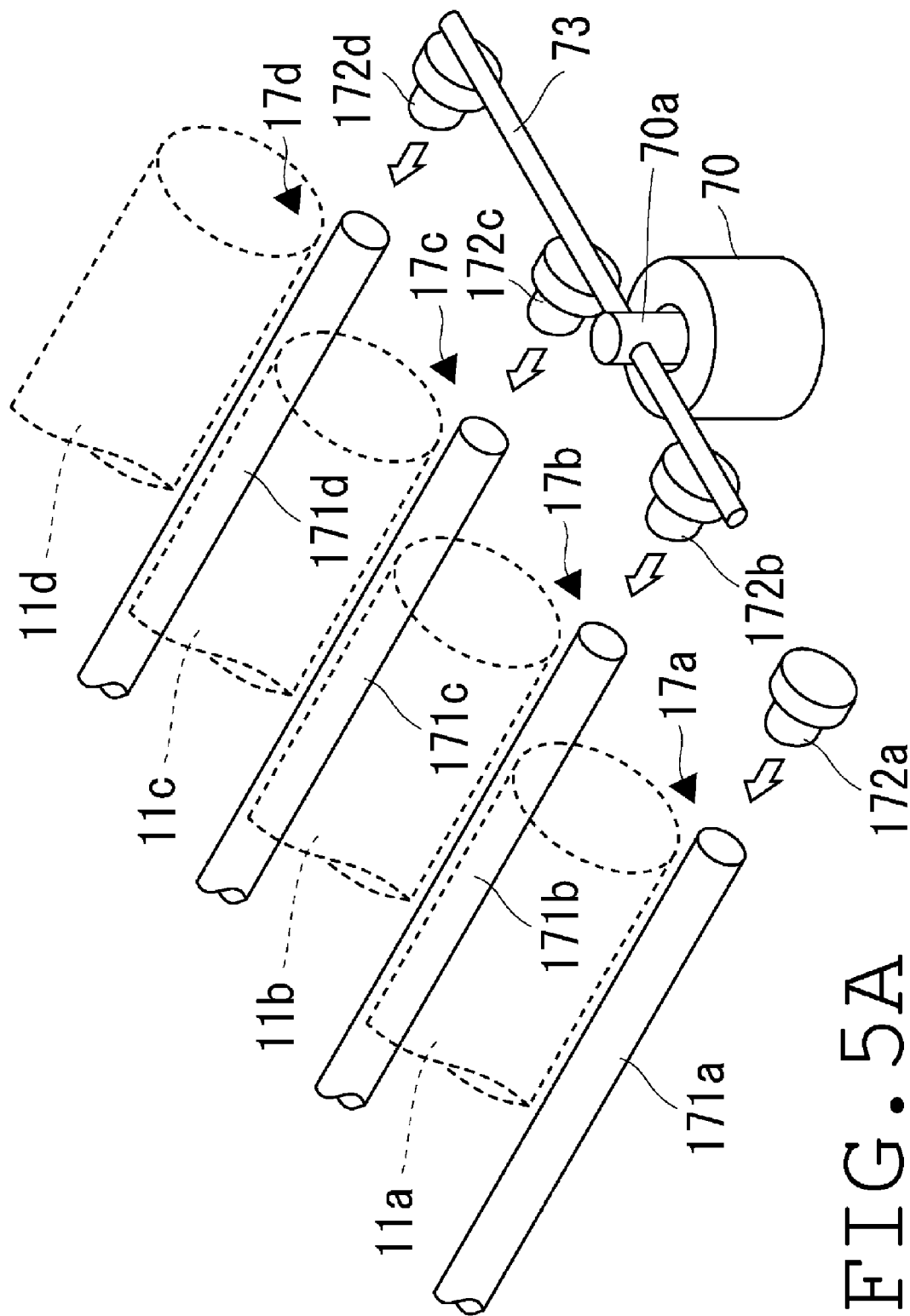


FIG. 4B



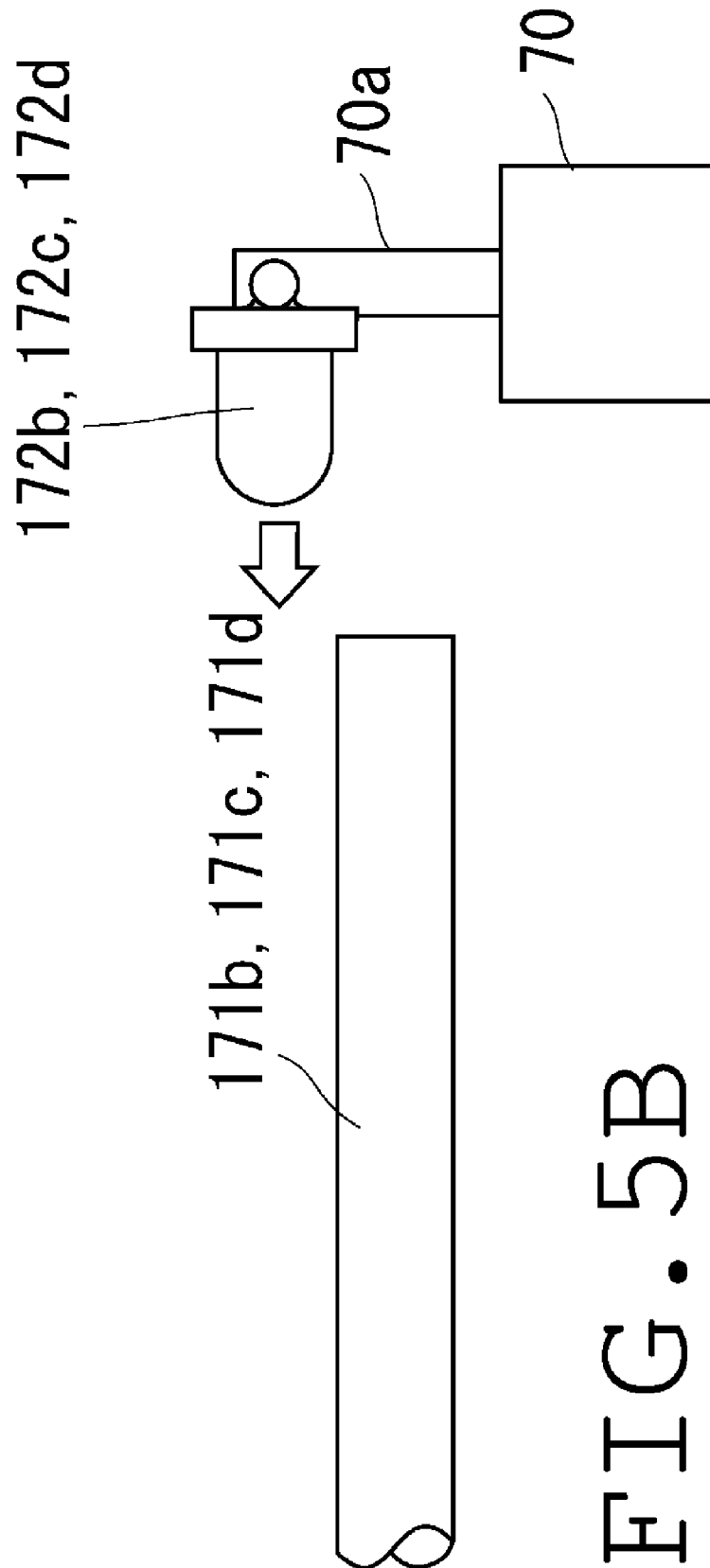
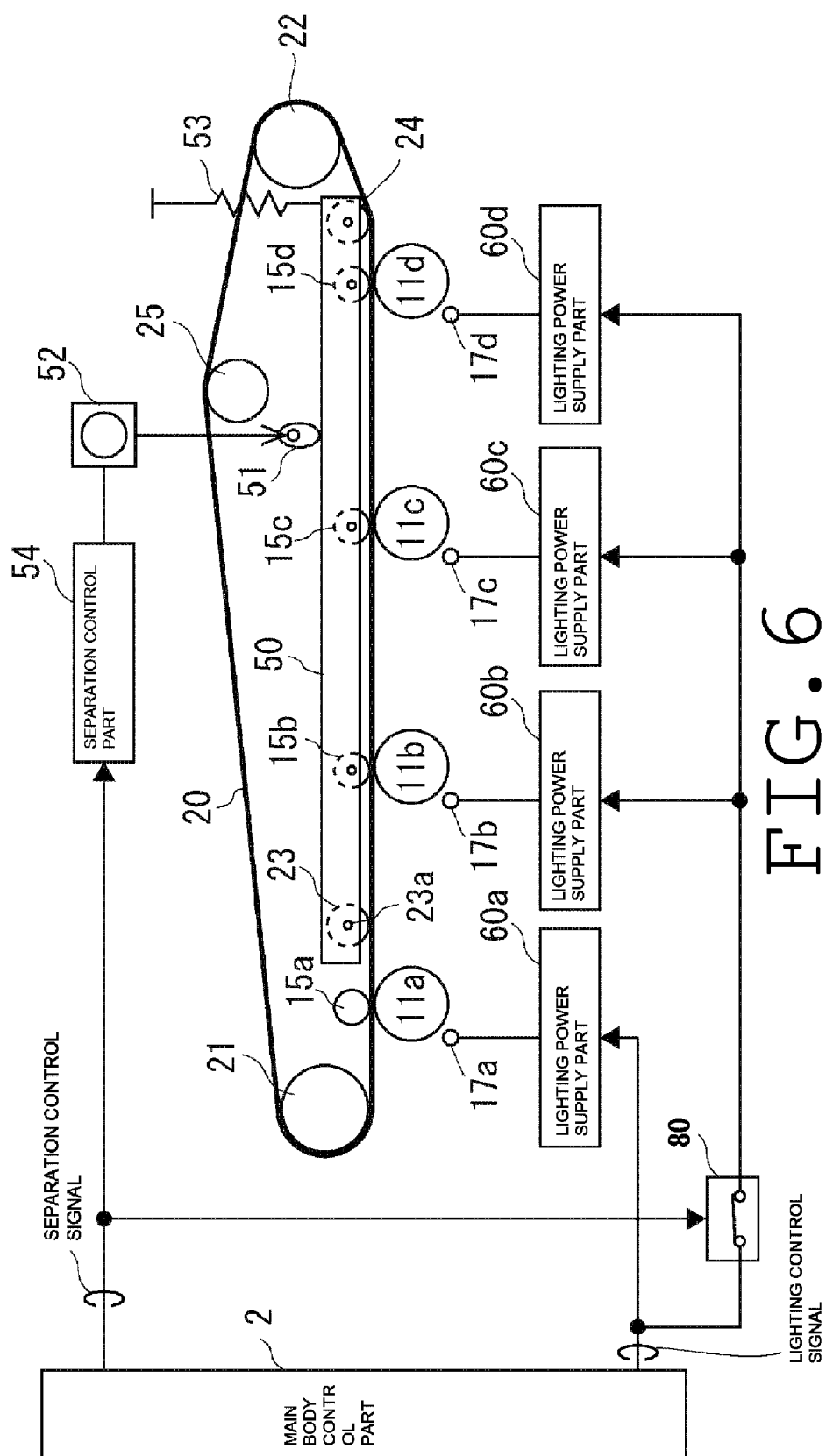
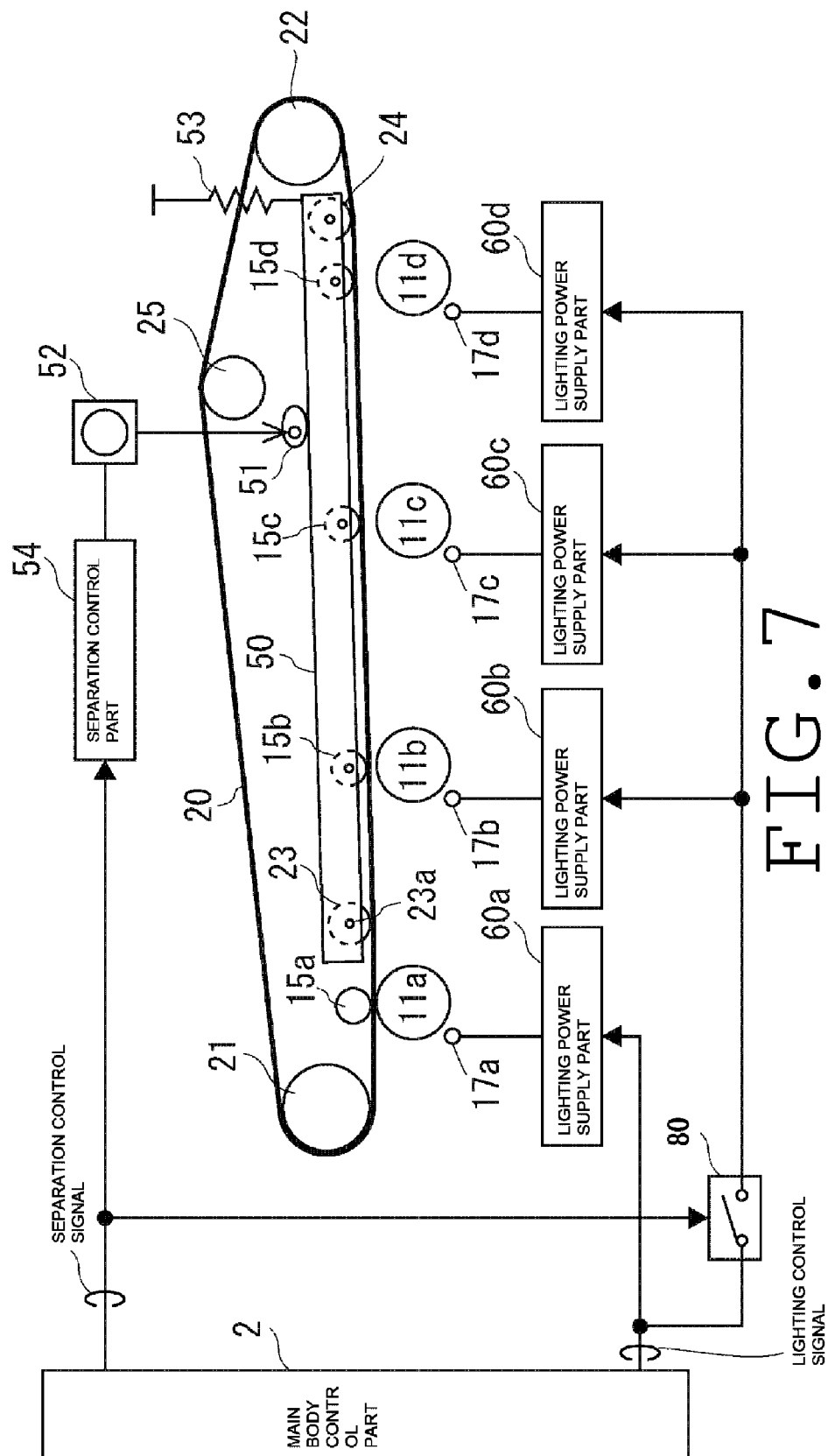


FIG. 5B





1

IMAGE FORMING APPARATUS

INCORPORATION BY REFERENCE

This application is based on and claims the benefit of
 priority from Japanese Patent Application No. 2014-175551
 filed on Aug. 29, 2014 and No. 2014-175552 filed on Aug. 29,
 2014, the contents of which are hereby incorporated by ref-
 erence.

BACKGROUND

The present disclosure relates to an electrophotographic
 image forming apparatus being capable of forming a single
 color monochrome image and a color image having a plural-
 ity of colors.

An image forming apparatus, such as a color printer,
 includes, for example, a plurality of photosensitive drums on
 which toner images of respective colors of black, yellow,
 magenta, and cyan are formed, and an intermediate transfer
 belt to which the toner images that have been formed on these
 plurality of photosensitive drums are transferred. With the
 plurality of photosensitive drums, a series of electrophoto-
 graphic processes of electrification, exposure, development,
 and transfer are performed. The toner images of the respective
 colors that have been formed on the respective photosensitive
 drums are primary-transferred to the intermediate transfer
 belt, and then collectively secondary-transferred to a paper
 from the intermediate transfer belt. Thereby, a color image is
 formed on the paper.

The respective photosensitive drums are provided with a
 static eliminator (an eraser), which eliminates static electric-
 ity from the surface of the respective photosensitive drums by
 light irradiation. The static electricity elimination is per-
 formed after the transfer as a pre-treatment for electrification
 at the next time. Such static electricity elimination must be
 suppressed to a necessary minimum, because it involves light
 irradiation on the surface of the photosensitive drum, result-
 ing in an optical fatigue thereof. Then, upon a monochrome
 image of a single color being formed, the static eliminators
 for the photosensitive drums of respective colors of yellow,
 magenta, and cyan that are used for forming a color image are
 controlled so as not to be lighted.

SUMMARY

The image forming apparatus of the present disclosure is
 an image forming apparatus including a monochrome image
 forming part that forms a toner image for a monochrome
 image on a monochrome photosensitive drum; color image
 forming parts that form toner images for color images on
 color photosensitive drums; and an intermediate transfer belt
 that once carries the toner image to be transferred to a record-
 ing paper, the image forming apparatus, at the time of mono-
 chrome printing, transferring only the toner image that has
 been formed on the monochrome photosensitive drum, to the
 intermediate transfer belt, and at the time of color printing,
 sequentially transferring the toner image that has been
 formed on the monochrome photosensitive drum, and the
 toner images that have been formed on the color photosensi-
 tive drums, to the intermediate transfer belt,

the image forming apparatus having;

a main body control part that controls image formation
 with the monochrome image forming part and the color
 image forming parts,

a nip separation mechanism that separates the intermediate
 transfer belt from the color photosensitive drums,

2

a separation control part that drives the nip separation
 mechanism on the basis of a separation control signal
 that is inputted from the main body control part,

a monochrome static eliminator that is comprised of a
 monochrome light guide body that extends in a rod
 shape along the monochrome photosensitive drum, and
 a monochrome light source that irradiates light on an end
 face of the monochrome light guide body,

color static eliminators that are comprised of color light
 guide bodies that extend in a rod shape along the color
 photosensitive drums, and color light sources that irra-
 diate light on end faces of the color light guide bodies,
 and

an irradiation location shifting mechanism that shifts the
 irradiation locations of the light that is emitted from the
 color light sources, from the end faces of the color light
 guide bodies, in a state of the intermediate transfer belt
 being separated from the color photosensitive drums.

Further, the image forming apparatus of the present disclo-
 sure is an image forming apparatus including a monochrome
 image forming part that forms a toner image for a mono-
 chrome image on a monochrome photosensitive drum; color
 image forming parts that form toner images for color images
 on color photosensitive drums; and an intermediate transfer
 belt that once carries the toner image to be transferred to a
 recording paper, the image forming apparatus, at the time of
 monochrome printing, transferring only the toner image that
 has been formed on the monochrome photosensitive drum, to
 the intermediate transfer belt, and at the time of color printing,
 sequentially transferring the toner image that has been
 formed on the monochrome photosensitive drum, and the
 toner images that have been formed on the color photosensi-
 tive drums, to the intermediate transfer belt,

the image forming apparatus having:

a main body control part that controls image formation
 with the monochrome image forming part and the color
 image forming parts,

a nip separation mechanism that separates the intermediate
 transfer belt from the color photosensitive drums,

a separation control part that drives the nip separation
 mechanism on the basis of a separation control signal
 that is inputted from the main body control part,

a monochrome static eliminator that eliminates static elec-
 tricity from the monochrome photosensitive drum,

a color static eliminator that eliminates static electricity
 from the color photosensitive drums,

a switch that is turned ON in a state of the intermediate
 transfer belt being abutted against the color photosensi-
 tive drums, and that is turned OFF in a state of the
 intermediate transfer belt being separated from the color
 photosensitive drums,

a monochrome lighting power supply part that makes
 power distribution to the monochrome static eliminator
 to light it up on the basis of a lighting control signal that
 is inputted from the main body control part, and

color lighting power supply parts that make power distri-
 bution to the color static eliminators to light them up on
 the basis of the lighting control signal that is inputted
 from the main body control part through the switch.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an appearance perspective view illustrating a
 configuration of a first embodiment of an image forming
 apparatus in accordance with the present disclosure;

3

FIG. 2 is a sectional schematic view illustrating an internal configuration of the first embodiment of the image forming apparatus in accordance with the present disclosure;

FIG. 3 is a sectional schematic view illustrating an internal configuration of the first embodiment of the image forming apparatus in accordance with the present disclosure;

FIG. 4A is a perspective view illustrating an example of configuration of an irradiation location shifting mechanism that shifts the irradiation locations of light sources of static eliminators shown in FIG. 1;

FIG. 4B is a side view illustrating an example of configuration of the irradiation location shifting mechanism that shifts the irradiation locations of the light sources of the static eliminators shown in FIG. 1;

FIG. 5A is a perspective view illustrating another example of configuration of the irradiation location shifting mechanism that shifts the irradiation locations of the light sources of the static eliminators shown in FIG. 1;

FIG. 5B is a side view illustrating another example of configuration of the irradiation location shifting mechanism that shifts the irradiation locations of the light sources of the static eliminators shown in FIG. 1;

FIG. 6 is a sectional schematic view illustrating an internal configuration of a second embodiment of the image forming apparatus in accordance with the present disclosure; and

FIG. 7 is a sectional schematic view illustrating an internal configuration of the second embodiment of the image forming apparatus in accordance with the present disclosure.

DETAILED DESCRIPTION

Next, a first embodiment of the present disclosure will be specifically explained with reference to the drawings.

An image forming apparatus of the present embodiment is a color printer 1, and with reference to FIG. 1, there are disposed an image forming part 10a, which accommodates image data of K (black); an image forming part 10b, which accommodates image data of C (cyan); an image forming part 10c, which accommodates image data of M (magenta); and an image forming part 10d, which accommodates image data of Y (yellow). Being adjacent to the top of the four image forming parts 10a, 10b, 10c, and 10d, an intermediate transfer belt 20 is provided. The intermediate transfer belt 20 is stretched over a driving roller 21, a driven roller 22, support rollers 23 and 24, and a tension roller 25.

In the four image forming parts 10a, 10b, 10c, and 10d, there are disposed photosensitive drums 11a, 11b, 11c, and 11d, respectively, which are for carrying visible images (toner images) of respective colors. Around the photosensitive drums 11a, 11b, 11c, and 11d, there are provided electrification apparatuses 12a, 12b, 12c, and 12d, which electrify the photosensitive drums 11a, 11b, 11c, and 11d, respectively; an exposure unit 13, which exposes image information on the photosensitive drums 11a, 11b, 11c, and 11d, respectively; development apparatuses 14a, 14b, 14c, and 14d, which form toner images on the photosensitive drums 11a, 11b, 11c, and 11d, respectively; primary transfer rollers 15a, 15b, 15c, and 15d, which transfer the toner images on the photosensitive drums 11a, 11b, 11c, and 11d to the intermediate transfer belt 20, respectively; cleaning apparatuses 16a, 16b, 16c, and 16d, which remove the toner remaining on the photosensitive drums 11a, 11b, 11c, and 11d, respectively; and static eliminators (erasers) 17a, 17b, 17c, and 17d, which irradiate light on the photosensitive drums 11a, 11b, 11c, and 11d to eliminate static electricity, respectively.

The toner images that have been formed on the photosensitive drums 11a, 11b, 11c, and 11d are sequentially trans-

4

ferred to the intermediate transfer belt 20, which is moved, while being abutted against the photosensitive drums 11a, 11b, 11c, and 11d. The toner images, which have been sequentially transferred to the intermediate transfer belt 20, are transferred to a recording paper P with a secondary transfer roller 18 at a time. The recording paper P is stored in a paper cassette 30, which is disposed in the bottom section, and is carried to the secondary transfer roller 18 in a recording paper carrying passage 33 through a feed roller 31 and registration rollers 32. The toner image that has been transferred to the recording paper P is fixed on the recording paper P with a fixing apparatus 19, and the recording paper P that has been provided with a print is discharged onto a top cover 40 by discharge rollers 34 through the recording paper carrying passage 33.

As shown in FIG. 2 and FIG. 3, the color printer 1 includes a frame 50, an eccentric cam 51, and a cam driving motor 52. The frame 50, the eccentric cam 51, and the cam driving motor 52 constitute a nip separation mechanism, which moves the primary transfer rollers 15b, 15c, and 15d in an up-down direction in the figure, separating the intermediate transfer belt 20 from the color photosensitive drums 11b, 11c, and 11d.

The frame 50 is a frame member that is formed substantially in a U shape in a plan view. The frame 50 rotatably supports the primary transfer rollers 15b, 15c, and 15d, and the support rollers 23 and 24 at both end parts in a width direction. The frame 50 is turnably supported around a turning axis 23a of the support roller 23. The support roller 23 is disposed between the primary transfer roller 15a of K (black) and the primary transfer roller 15b of C (cyan). Further, from the support roller 23 toward the upstream side of the moving direction of the intermediate transfer belt 20, the primary transfer roller 15b of C (cyan), the primary transfer roller 15c of M (magenta), the primary transfer roller 15d of Y (yellow), and the support roller 24 are disposed in this order. Therefore, by turning the frame 50 around the support roller 23, the frame 50 can be moved to an abutting position shown in FIG. 2, and to a separation position shown in FIG. 3, respectively. In the abutting position shown in FIG. 2, the primary transfer roller 15b of C (cyan), the primary transfer roller 15c of M (magenta), and the primary transfer roller 15d of Y (yellow) are abutted against the photosensitive drums 11b, 11c, and 11d through the intermediate transfer belt 20, respectively, to form a primary transfer nip. In the separation position shown in FIG. 3, the primary transfer roller 15b of C (cyan), the primary transfer roller 15c of M (magenta), and the primary transfer roller 15d of Y (yellow) are separated from the photosensitive drums 11b, 11c, and 11d, respectively, the intermediate transfer belt 20 being separated from the photosensitive drums 11b, 11c, and 11d.

In addition, the frame 50 is urged in a counterclockwise direction around the turning axis 23a of the support roller 23 by an urging member 53, such as a spring, with an eccentric cam 51 being abutted against the upper end part of the frame 50. Thereby, the eccentric cam 51 functions as a member to move the frame 50 to the abutting position or the separation position, respectively, and fix it in the abutting position or the separation position. The eccentric cam 51 is turned clockwise or counterclockwise by a turning force transmitted from the cam driving motor 52. The cam driving motor 52 is an apparatus to transmit a turning force to the eccentric cam 51, the rotation drive thereof being controlled by the separation control part 54. The separation control part 54 is a motor driver, controlling the rotation drive of the cam driving motor 52 on the basis of a separation control signal from a main body control part 2.

5

The main body control part **2** is an information processing part of a microcomputer, or the like, including a CPU (Central Processing Unit), a ROM (Read Only Memory), a RAM (Random Access Memory), and the like. In the ROM, a control program for performing operation control of the image forming apparatus is stored. The CPU reads out the control program stored in the ROM, and expands the control program in the RAM. Thereby, the respective components (the image forming parts **10a**, **10b**, **10c**, and **10d**, the exposure unit **13**, the fixing apparatus **19**, the intermediate transfer belt **20**, and the like) are controlled to realize a series of image formation operations.

In the case where full-color printing in four colors is to be performed with the color printer **1**, the main body control part **2** outputs a separation control signal (for example, a Hi level signal) to instruct the abutting position to be taken. When a separation control signal to instruct the abutting position to be taken is inputted, the separation control part **54** causes a turning force to be transmitted from the cam driving motor **52** to the eccentric cam **51**. Thereby, the eccentric cam **51** is turned such that it takes a first position where the longer-diameter direction of the eccentric cam **51** is substantially orthogonal to the intermediate transfer belt **20**. With the eccentric cam **51** being turned to the first position, the frame **50**, which is pressed by the eccentric cam **51**, is turned clockwise around the turning axis **23a** of the support roller **23** against the urging force of the urging member **53**.

Thereby, as shown in FIG. 2, the intermediate transfer belt **20** is abutted against the photosensitive drums **11b**, **11c**, and **11d**. The primary transfer roller **15a** of K (black) causes the intermediate transfer belt **20** to be always abutted against the photosensitive drum **11a**. Therefore, when the intermediate transfer belt **20** is moved to the abutting position, where it is abutted against the photosensitive drums **11b**, **11c**, and **11d**, the intermediate transfer belt **20** is abutted against all of the photosensitive drums **11a**, **11b**, **11c**, and **11d**. Therefore, by moving the intermediate transfer belt **20** to the abutting position, it is made possible to perform full-color printing in four colors with the color printer **1**.

On the other hand, in the case where monochrome printing is to be performed with the color printer **1**, the main body control part **2** outputs a separation control signal (for example, a Low level signal) to instruct the separation position to be taken. When a separation control signal to instruct the separation position to be taken is inputted, the separation control part **54** causes a turning force to be transmitted from the cam driving motor **52** to the eccentric cam **51**. Thereby, the eccentric cam **51** is turned such that it takes a second position where the shorter-diameter direction of the eccentric cam **51** is substantially orthogonal to the intermediate transfer belt **20**. With the eccentric cam **51** being turned to the second position, the frame **50** is turned counterclockwise around the turning axis **23a** of the support roller **23** by the urging force of the urging member **53**.

Thereby, as shown in FIG. 3, the intermediate transfer belt **20** is separated from the plurality of photosensitive drums **11b**, **11c**, and **11d**. Therefore, when the intermediate transfer belt **20** is moved to the separation position, where it is separated from the photosensitive drums **11b**, **11c**, and **11d**, the intermediate transfer belt **20** is abutted against only the photosensitive drum **11a**. Therefore, by moving the intermediate transfer belt **20** to the separation position, it is made possible to perform monochrome printing with the color printer **1**.

As shown in FIG. 4A, the static eliminators **17a**, **17b**, **17c**, and **17d** include light guide bodies **171a**, **171b**, **171c**, and **171d** extending in a rod shape along the photosensitive drums **11a**, **11b**, **11c**, and **11d**, and LEDs **172a**, **172b**, **172c**, and

6

172d, which are light sources that irradiate light on end faces of the light guide bodies **171a**, **171b**, **171c**, and **171d**, respectively. The light guide bodies **171a**, **171b**, **171c**, and **171d** guide light that has been made incident from the end faces, irradiating the light on the photosensitive drums **11a**, **11b**, **11c**, and **11d**, respectively.

As shown in FIG. 2 and FIG. 3, the LEDs **172a**, **172b**, **172c**, and **172d** for the static eliminators **17a**, **17b**, **17c**, and **17d** are lighted up by power distribution from the lighting power supply parts **60a**, **60b**, **60c**, and **60d**. Further, the lighting power supply parts **60a**, **60b**, **60c**, and **60d** control power distribution to the static eliminators **17a**, **17b**, **17c**, and **17d** on the basis of a common lighting control signal from the main body control part **2**.

The LED **172a** for the static eliminator **17a**, which eliminates static electricity from the photosensitive drum **11a**, which is for carrying a toner image for a monochrome image, is supported by a supporting member (not shown) that is fixed to the housing, or the like. Therefore, the irradiation location of the light that is emitted from the LED **172a** is always the end face of the light guide body **171a**.

As shown in FIG. 4A, the LEDs **172b**, **172c**, and **172d** for the static eliminators **17b**, **17c**, and **17d**, which eliminate static electricity from the photosensitive drums **11b**, **11c**, and **11d**, respectively, which are for carrying toner images for color images, are fixed to one end of the support bars **71b**, **71c**, and **71d**, respectively, which are turnably supported by the turning shaft **72**. Further, there is provided a configuration in which the other ends of the support bars **71b**, **71c**, and **71d** are connected to a plunger **70a** of a solenoid **70**, and in accordance with advance/retract of the plunger **70a**, the support bars **71b**, **71c**, and **71d** are turned.

As shown in FIG. 2 and FIG. 3, the solenoid **70** is controlled to be advanced/retracted by a separation control signal. The solenoid **70** moves the plunger **70a** to a contracted position with a separation control signal (for example, a Hi level signal) to instruct the abutting position to be taken, and moves the plunger **70a** to an extended position with a separation control signal (for example, a Low level signal) to instruct the separation position to be taken, respectively.

In a state in which the plunger **70a** is moved to the contracted position, as shown in FIG. 4A, the irradiation locations of the light emitted from the LEDs **172b**, **172c**, and **172d** are the end faces of the light guide bodies **171b**, **171c**, and **171d**, respectively. Therefore, in the case where full-color printing in four colors is to be performed with the color printer **1**, the light emitted from the static eliminator **17a** is irradiated on the photosensitive drum **11a**, which is for carrying a toner image for a monochrome image, for making static electricity elimination therefor. In addition, the light that is emitted from the static eliminators **17b**, **17c**, and **17d**, respectively, is irradiated on the photosensitive drums **11b**, **11c**, and **11d**, which are for carrying toner images for color images, for making static electricity elimination therefor.

In a state in which the plunger **70a** is moved in the extended position, as shown in FIG. 4B, with the support bars **71b**, **71c**, and **71d** being turned, the direction of light that is emitted from the LEDs **172b**, **172c**, and **172d**, respectively, is changed. Therefore, the respective irradiation locations of the light that is emitted from the LEDs **172b**, **172c**, and **172d**, are shifted from the end faces of the light guide bodies **171b**, **171c**, and **171d**. Therefore, in the case where monochrome printing is to be performed with the color printer **1**, the light that is emitted from the static eliminator **17a** is irradiated on the photosensitive drum **11a**, which is for carrying a toner image for a monochrome image, for making static electricity elimination therefor. However, the light that is irradiated from

7

the static eliminators 17b, 17c, and 17d, respectively, is not irradiated on the photosensitive drums 11b, 11c, and 11d, which are for carrying toner images for color images, thereby the static electricity elimination being not made therefor.

In the present embodiment, there is provided a configuration in which the solenoid 70, which is controlled to be advanced/retracted by a separation control signal, is used to change the direction of light that is emitted from the LEDs 172b, 172c, and 172d, respectively. However, as shown in FIG. 5A and FIG. 5B, the LEDs 172b, 172c, and 172d may be supported with a common support member 73, and the LEDs 172b, 172c, and 172d, which are supported by the support member 73, may be moved to directions intersecting with the axes of the light guide bodies 171b, 171c, and 171d, using the solenoid 70, respectively. Thereby, the respective irradiation location of the light that is emitted from the LEDs 172b, 172c, and 172d can be shifted from the end faces of the light guide bodies 171b, 171c, and 171d. In this case, it is required that the plunger 70a be advanced/retracted at a large stroke, as compared to the case where the direction of light is changed, however, the number of component parts, such as the support bars 71b, 71c, and 71d, can be reduced.

In addition, the support member 73 may be shifted interlockingly with the operation of the nip separation mechanism (movement of the frame 50 or turning of the eccentric cam 51), which moves the primary transfer rollers 15b, 15c, and 15d. In this case, the solenoid 70 can be obviated.

Further, there may be provided a light shielding plate which is advanced between the LEDs 172b, 172c, and 172d and the end faces of the light guide bodies 171b, 171c, and 171d, the light shielding plate being advanced/retracted with the operation of the solenoid 70 or the nip separation mechanism. Thereby, the respective irradiation locations of the light that is emitted from the LEDs 172b, 172c, and 172d can be changed. In this case, by advancing the light shielding plate between the LEDs 172b, 172c, and 172d and the end faces of the light guide bodies 171b, 171c, and 171d, the respective irradiation locations of the light that is emitted from the LEDs 172b, 172c, and 172d are changed into locations on the light shielding plate.

As described above, according to the present embodiment, there is provided a color printer 1 (an image forming apparatus) including an image forming part 10a (a monochrome image forming part) that forms a toner image for a monochrome image on a photosensitive drum 11a (a monochrome photosensitive drum); image forming parts 10b, 10c, and 10d (color image forming parts) that form toner images for color images on photosensitive drums 11b, 11c, and 11d (color photosensitive drums), respectively; and an intermediate transfer belt 20 that once carries the toner image to be transferred to a recording paper, the color printer 1, at the time of monochrome printing, transferring only the toner image that has been formed on the photosensitive drum 11a, to the intermediate transfer belt 20, and at the time of color printing, sequentially transferring the toner image that has been formed on the photosensitive drum 11a, and the toner images that have been formed on the photosensitive drums 11b, 11c, and 11d, respectively, to the intermediate transfer belt 20, the color printer 1 having:

- a main body control part 2 that controls image formation with image forming parts 10a, 10b, 10c, and 10d,
- a nip separation mechanism (a frame 50, an eccentric cam 51, and a cam driving motor 52) that separates the intermediate transfer belt 20 from the photosensitive drums 11b, 11c, and 11d,

8

a separation control part 54 that drives the nip separation mechanism on the basis of a separation control signal that is inputted from the main body control part 2,

a static eliminator 17a that is comprised of a light guide body 171a that extends in a rod shape along the photosensitive drum 11a, and an LED 172a (a monochrome light source) that irradiates light on an end face of the light guide body 171a,

static eliminators 17b, 17c, and 17d that are comprised of light guide bodies 171b, 171c, and 171d that extend in a rod shape along the photosensitive drums 11b, 11c, and 11d, and LEDs 172b, 172c, and 172d (color light sources) that irradiate light on end faces of the light guide bodies 171b, 171c, and 171d, and

an irradiation location shifting means (a solenoid 70, support bars 71b, 71c, and 71d, and a turning shaft 72) that shifts the irradiation locations of the light that is emitted from the LEDs 172b, 172c, and 172d, from the end faces of the light guide bodies 171b, 171c, and 171d, in a state of the intermediate transfer belt 20 being separated from the photosensitive drums 11b, 11c, and 11d.

With this configuration, at the time of monochrome printing, even if the color static eliminators 17b, 17c, and 17d are lighted up, light will not be irradiated on the photosensitive drums 11b, 11c, and 11d of yellow, magenta, and cyan. Therefore, lighting control of the static eliminator 17a, which eliminates static electricity from the photosensitive drum 11a of black, and lighting control of the static eliminators 17b, 17c, and 17d, which eliminate static electricity from the photosensitive drums 11b, 11c, and 11d of yellow, magenta, and cyan, can be performed with a commonalized lighting control signal. Therefore, the static eliminators 17a, 17b, 17c, and 17d can be controlled with a single port of the CPU in the main body control part 2.

Further, according to the present embodiment, the irradiation location shifting means (the solenoid 70) shifts the irradiation locations of the light that is emitted from the LEDs 172b, 172c, and 172d from the end faces of the light guide bodies 171b, 171c, and 171d on the basis of a lighting control signal that is inputted from the main body control part 2.

Further, according to the present embodiment, the irradiation location shifting means shifts the irradiation locations of the light that is emitted from the LEDs 172b, 172c, and 172d, from the end faces of the light guide bodies 171b, 171c, and 171d, being interlocked with the operation of the nip separation mechanism.

Next, a second embodiment of the present disclosure will be specifically explained with reference to the drawings.

With the present embodiment, the light sources of the light that is irradiated on the photosensitive drums 11a, 11b, 11c, and 11d by the static eliminators 17a, 17b, 17c, and 17d, respectively, are constituted by lamps or LEDs that are lighted up by power distribution from the lighting power supply parts 60a, 60b, 60c, and 60d. The lighting power supply parts 60a, 60b, 60c, and 60d control the power distribution to the static eliminators 17a, 17b, 17c, and 17d on the basis of a common lighting control signal from the main body control part 2. The lighting control signal that is outputted from the main body control part 2 is directly inputted to the lighting power supply part 60a, and is inputted to the lighting power supply parts 60b, 60c, and 60d through the switch 80 shown in FIGS. 6 and 7.

The switch 80 is controlled to be turned ON/OFF by a separation control signal from the main body control part 2, being controlled to be turned ON by a separation control signal (for example, a Hi level signal) that instructs an abutting position to be taken, while being controlled to be turned

OFF by a separation control signal (for example, a Low level signal) that instructs a separation position to be taken. Therefore, in full-color printing in four colors, the switch **80** is controlled to be turned ON, the lighting control signal from the main body control part **2** is inputted to the lighting power supply parts **60a**, **60b**, **60c**, and **60d**, respectively, the main body control part **2** controlling the lighting of the static eliminators **17a**, **17b**, **17c**, and **17d**. Contrarily to this, in monochrome printing, the switch **80** is controlled to be turned OFF, and thus the lighting control signal from the main body control part **2** is inputted only to the lighting power supply part **60a**, the main body control part **2** controlling only the lighting of the static eliminator **17a**.

In the present embodiment, the switch **80** has been configured such that it is controlled to be turned ON/OFF from a separation control signal from the main body control part **2**. However, the switch **80** may be constituted by a physical switch that is turned ON/OFF with the operation (movement of the frame **50** or turning of the eccentric cam **51**) of the nip separation mechanism, which moves the primary transfer rollers **15b**, **15c**, and **15d**. In addition, in the present embodiment, there has been provided a configuration in which the intermediate transfer belt **20** is moved, however, there may be provided a configuration in which the image forming parts **10b**, **10c**, and **10d** are moved in a direction to be separated from the intermediate transfer belt **20**.

As described above, according to the present embodiment, there is provided a color printer **1** (an image forming apparatus) including an image forming part **10a** (a monochrome image forming part) that forms a toner image for a monochrome image on a photosensitive drum **11a** (a monochrome photosensitive drum); image forming parts **10b**, **10c**, and **10d** (color image forming parts) that form toner images for color images on photosensitive drums **11b**, **11c**, and **11d** (color photosensitive drums), respectively; and an intermediate transfer belt **20** that once carries the toner image to be transferred to a recording paper, the color printer **1**, at the time of monochrome printing, transferring only the toner image that has been formed on the photosensitive drum **11a**, to the intermediate transfer belt **20**, and at the time of color printing, sequentially transferring the toner image that has been formed on the photosensitive drum **11a**, and the toner images that have been formed on the photosensitive drums **11b**, **11c**, and **11d**, respectively, to the intermediate transfer belt **20**, the color printer **1** having;

a main body control part **2** that controls image formation with image forming parts **10a**, **10b**, **10c**, and **10d**,

a nip separation mechanism (a frame **50**, an eccentric cam **51**, and a cam driving motor **52**) that separates the intermediate transfer belt **20** from the photosensitive drums **11b**, **11c**, and **11d**,

a separation control part **54** that drives the nip separation mechanism on the basis of a separation control signal that is inputted from the main body control part **2**,

a static eliminator **17a** (a monochrome static eliminator) that eliminates static electricity from the photosensitive drum **11a**,

static eliminators **17b**, **17c**, and **17d** (color static eliminators) that eliminate static electricity from the photosensitive drums **11b**, **11c**, and **11d**, respectively,

a switch **80** that is turned ON in a state of the intermediate transfer belt **20** being abutted against the photosensitive drums **11b**, **11c**, and **11d**, and is turned OFF in a state of the intermediate transfer belt **20** being separated from the photosensitive drums **11b**, **11c**, and **11d**,

a lighting power supply part **60a** (a monochrome lighting power supply part) that makes power distribution to the

static eliminator **17a** to light it up on the basis of a lighting control signal that is inputted from the main body control part **2**, and

lighting power supply parts **60b**, **60c**, and **60d** (color lighting power supply parts) that make power distribution to the static eliminators **17b**, **17c**, and **17d** to light them up, respectively, on the basis of a lighting control signal that is inputted from the main body control part **2** through the switch **80**.

With this configuration, lighting control of the static eliminator **17a**, which eliminates static electricity from the photosensitive drum **11a** of black, and lighting control of the static eliminators **17b**, **17c**, and **17d**, which eliminate static electricity from the photosensitive drums **11b**, **11c**, and **11d** of yellow, magenta, and cyan, can be performed with a commonalized lighting control signal. Therefore, the static eliminators **17a**, **17b**, **17c**, and **17d** can be controlled with a single port of the CPU in the main body control part **2**.

Further, according to the present embodiment, the switch **80** is controlled to be turned ON/OFF on the basis of a separation control signal.

Further, according to the present embodiment, the switch **80** may be a physical switch that is turned ON/OFF with the operation of the nip separation mechanism.

The present disclosure is not limited to the above respective embodiments, and it is obvious that the respective embodiments can be appropriately modified within the scope of the technical concept of the present disclosure. In addition, the number, location, geometry, and the like, of the above components are not limited to those mentioned in the above embodiments, and may be adapted to be a number, location, geometry, and the like, that are appropriate for embodying the present disclosure. In the respective figures, the same component is provided with the same symbol.

What is claimed is:

1. An image forming apparatus comprising a monochrome image forming part that forms a toner image for a monochrome image on a monochrome photosensitive drum; color image forming parts that form toner images for color images on color photosensitive drums; and an intermediate transfer belt that once carries the toner image to be transferred to a recording paper, the image forming apparatus, at the time of monochrome printing, transferring only the toner image that has been formed on the monochrome photosensitive drum, to the intermediate transfer belt, and at the time of color printing, sequentially transferring the toner image that has been formed on the monochrome photosensitive drum, and the toner images that have been formed on the color photosensitive drums, to the intermediate transfer belt,

the image forming apparatus including:

a main body control part that controls image formation with the monochrome image forming part and the color image forming parts,

a nip separation mechanism that separates the intermediate transfer belt from the color photosensitive drums,

a separation control part that drives the nip separation mechanism on the basis of a separation control signal that is inputted from the main body control part,

a monochrome static eliminator that is comprised of a monochrome light guide body that extends in a rod shape along the monochrome photosensitive drum, and a monochrome light source that irradiates light on an end face of the monochrome light guide body,

color static eliminators that are comprised of color light guide bodies that extend in a rod shape along the color

11

photosensitive drums, and color light sources that irradiate light on end faces of the color light guide bodies, and

an irradiation location shifting mechanism that shifts the irradiation locations of the light that is emitted from the color light sources, from the end faces of the color light guide bodies, in a state of the intermediate transfer belt being separated from the color photosensitive drums.

2. The image forming apparatus according to claim 1, wherein the irradiation location shifting mechanism shifts the irradiation locations of the light that is emitted from the color light sources, from the end faces of the color light guide bodies on the basis of a lighting control signal that is inputted from the main body control part.

3. The image forming apparatus according to claim 1, wherein the irradiation location shifting mechanism shifts the irradiation locations of the light that is emitted from the color light sources, from the end faces of the color light guide bodies, being interlocked with the operation of the nip separation mechanism.

4. An image forming apparatus comprising a monochrome image forming part that forms a toner image for a monochrome image on a monochrome photosensitive drum; color image forming parts that form toner images for color images on color photosensitive drums; and an intermediate transfer belt that once carries the toner image to be transferred to a recording paper, the image forming apparatus, at the time of monochrome printing, transferring only the toner image that has been formed on the monochrome photosensitive drum, to the intermediate transfer belt, and at the time of color printing, sequentially transferring the toner image that has been formed on the monochrome photosensitive drum, and the toner images that have been formed on the color photosensitive drums, to the intermediate transfer belt,

the image forming apparatus including:

a main body control part that controls image formation with the monochrome image forming part and the color image forming parts,

12

a nip separation mechanism that separates the intermediate transfer belt from the color photosensitive drums,

a separation control part that drives the nip separation mechanism so that the intermediate transfer belt is abutted against the color photosensitive drums when a separation control signal that is inputted from the main body control part to instruct the abutting position to be taken is inputted, and that the intermediate transfer belt is separated from the color photosensitive drums when the separation control signal instruct the separation position to be taken is inputted,

a monochrome static eliminator that eliminates static electricity from the monochrome photosensitive drum,

a color static eliminator that eliminates static electricity from the color photosensitive drums,

a switch that is turned ON when the separation control signal to instruct the abutting position to be taken is inputted, and that is turned OFF when the separation control signal to instruct the separation position to be taken is inputted,

a monochrome lighting power supply part that makes power distribution to the monochrome static eliminator to light it up on the basis of a lighting control signal that is inputted from a single port of the main body control part, and

color lighting power supply parts that makes power distribution to the color static eliminators to light them up on the basis of the lighting control signal that is inputted from the single port of the main body control part through the switch.

5. The image forming apparatus according to claim 4, wherein the switch is controlled to be turned ON/OFF on the basis of the separation control signal.

6. The image forming apparatus according to claim 4, wherein the switch is a physical switch that is turned ON/OFF with the operation of the nip separation mechanism.

* * * * *